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Department of Education

EdTech 2001

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Massachusetts Department of Education

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Contents

Introduction

Over the past five years Massachusetts schools have made impressive progress in building a technology infrastructure. Classroom access to the Internet has nearly quadrupled, with 88% of classrooms connected today. The number of students sharing a high-speed computer, more than fifteen in 1996, has been reduced to less than six. Per student spending on technology has increased more than 60% statewide since 1996.

While many districts have made great strides in building a technology infrastructure, some students still do not have sufficient access to computers. Other students are using outdated machines that do not take advantage of the rich learning opportunities offered by the Internet and recent software innovations. Even when computers are available, technical problems sometimes prevent students from using them on a regular basis because adequate technical support is not available.

Also, while infrastructure is critical, we must remember that our ultimate goal is to increase student achievement. Although technology holds great promise for improving teaching and learning, even state-of-the-art computers are unlikely to increase student achievement unless teachers are able to use them effectively in the classroom. Districts need to provide curriculum support staff and professional development opportunities to help teachers use technology effectively.

So how do we evaluate our progress and determine what is most needed today? We can start by looking at the technology goals we set two years ago, described in detail in the Department's publication, *Local Technology Plan Benchmark Standards for the Year 2003*.[1] Using the data submitted by schools in 2001, this report will show how districts are progressing in meeting those standards.

[1] *Local Technology Plan Benchmark Standards for the Year 2003*. This document is included in the Appendix. It can also be downloaded in PDF format at http://www.doe.mass.edu/edtech/broad/sixstandards.PDF

Commitment to a Clear Vision

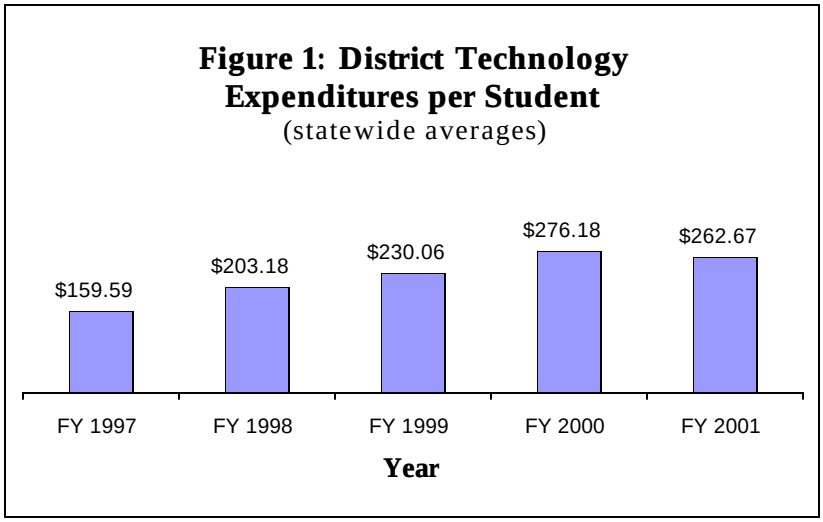
To approve school districts' technology plans, the Massachusetts Department of Education asks districts to update these plans electronically every year. Updating the technology plan provides an opportunity for districts to review the progress they have made, set new goals, and identify the resources and strategies that will help them promote the most effective use of technology in their schools. A state-approved technology plan is also required in order for school districts to be eligible for technology grants and federal E-rate discounts. In 2001, 91% of school districts submitted updates to their technology plans, using the Department's online forms.

Goals

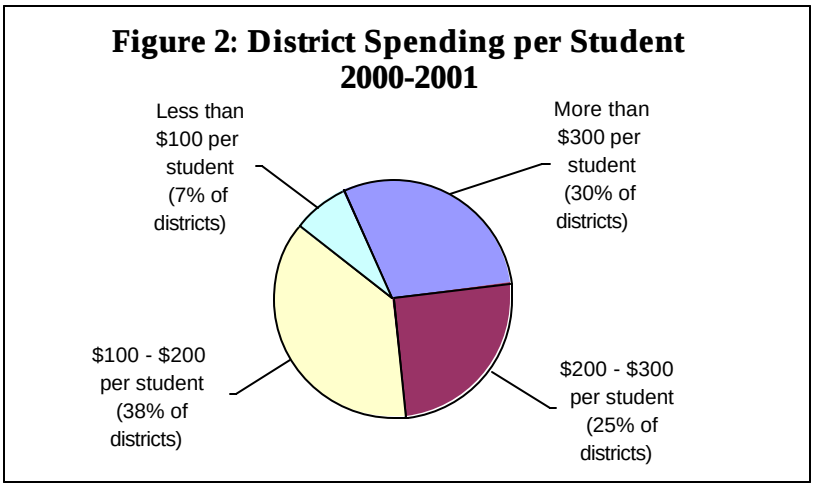
A district's technology plan should focus on how technology will be used to help raise the academic achievement of all students, reflecting the goals stated in the district's school improvement plan. The Department also urges districts to include the state's new *Recommended PreK-12 Instructional Technology Standards for Students*[2] in their technology planning to ensure that students will have the technology skills they will need for the twenty-first century.

Funding

An important part of the technology plan is the district's commitment to funding for technology. Between 1997 and 2000, statewide technology spending per student rose steadily. In 2001, spending per student decreased slightly to $262.67. Figure 1 shows the average expenditures for technology across the state for technology, including monies from the district's operational budget, municipal bonds, and grants from federal, state, local, and private sources. Figure 2 shows the percentages of districts that fall into various spending ranges.



[2] *Recommended PreK-12 Instructional Technology Standards for Students*. The complete document can be downloaded in PDF format at http://www.doe.mass.edu/edtech/01docs/itstand01.pdf



These figures pale in comparison to technology expenditures in the corporate world where the amount spent per employee is many times higher. Businesses generally have a ratio of one computer per employee, as opposed to the five students to one computer recommended in our benchmark standards. Because businesses buy more expensive computers and replace them more frequently, they also spend more than twice as much per computer than public schools do. Additionally, businesses spend far more on technical support personnel to ensure that productivity is not lost due to technical difficulties.[3]

On average, school districts spent less than 4% of their total budgets on technology. Technology spending covers classroom technology, technology used by administrators, professional development, networking, maintenance, and support. In addition to the costs for hardware, software, and technology-related supplies, there are salaries for technology staff, as well as costs for contracted services.

With pressures to trim budgets at the federal, state, and local levels, acquiring funds for technology can be a challenge. One source of funding is the federal E-rate program, which provides discounts for Internet services, telecommunications, and wiring.[4] With discounts based on economic disadvantage and location (rural or urban), some Massachusetts districts are eligible for discounts as high as 79%. In 2001, 65% of Massachusetts school districts took advantage of these discounts.

Another source of funding, the Enhancing Education Through Technology (Ed Tech) Grant, will be available in 2002 under the new federal *No Child Left Behind* act. Half of the funds from this program will be distributed to districts on a formula basis, while the

[3] *A School Administrator's Guide to Planning for the Total Cost of New Technology*, a 2001 white paper issued by the consortium for School Networking, is available at http://www.cosn.org/tco/project_pubs.html

[4] School districts can now apply online for E-rate discounts, making the process more convenient. For more information, go to the Web site of the Universal Service Administrative Company http://www.universalservice.org/

other half will be distributed through a competitive grant program. This program will require districts to use at least 25% of the funds for technology professional development.

Many districts have used grant programs to fund technology. While these programs are useful for exploring new technologies and related pedagogies, districts should not count on grants to fund their technology programs. Rather, technology expenditures, including funds for maintenance and support, should be a regular part of districts' operational budgets.

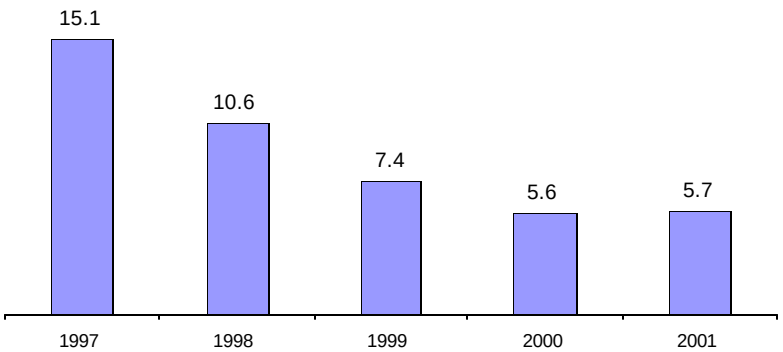
Access to Computers

The benchmark standards recommend that, by the year 2003, every district have at least a five to one ratio of students to modern, fully functioning, Internet-enabled computers and devices. These computers allow students to take advantage of the rich educational resources available on the Internet and on CD-ROM, including text, graphics, multimedia, and interactive activities.

Access Across the State

Based on the data submitted by school districts in 2001, Massachusetts now has an average of 5.7 students per high-speed computer (see Figure 3). These are multimedia computers with CD-ROM and Internet capability using an up-to-date browser with a minimum of 16 MB RAM (labeled as Type A and Type B on the Department's computer inventory form).[5]

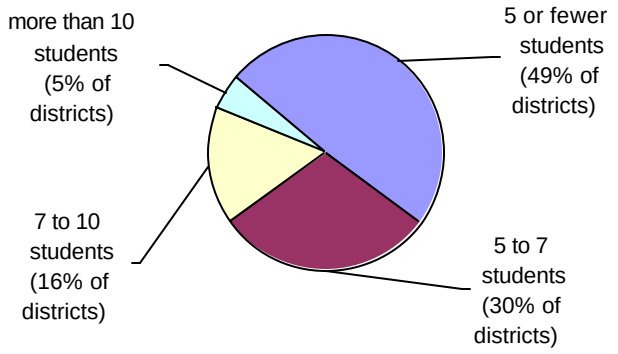
Figure 3: Students per Computer
(statewide averages for Type A/B computers)



[5] During the period that this data was collected, Type A computers were defined as machines with 64 MB RAM or higher, which are capable of running multimedia applications, high-end applications, and streamed video. Type B computers were defined as multimedia computers with 16 MB RAM to 64 MB RAM, which have CD-ROM access and Internet capability using a browser. Type C computers were defined as machines with 16 MB RAM or lower, with or without Internet capability.

An examination of the data from individual districts reveals that 49% met or surpassed the benchmark standard of five students per high-speed computer. (See Figure 4.) Last year only 36% of districts had met the benchmark. Additionally, more than half of the districts that met the benchmark have student-computer ratios of four to one or better.

Figure 4: Students per Computer
(Type A or B)



The district statistics listed at the end of this report show each district's ratio of students per Types A and B computers. These ratios were calculated using the data reported on the school profiles of the Tech Plan Updates. Districts that did not submit data in 2001 are not included in the list.

Equity

Like a statewide average, a district average may not accurately characterize conditions in all of the schools in that district. While many districts have reached the benchmark standard of five or fewer students per computer, the ratios for individual schools within those districts may vary. In fact, in nearly half (46%) of the districts that met the standard, there were individual schools that fell below the standard. It is important that schools address these inequities so that every student will have an opportunity to benefit from technology's power.

Fortunately, access to computers in Massachusetts school does not appear to be linked to poverty. Districts with the highest concentration of students from low-income households have ratios very similar to the statewide ratios for Type A/B computers.[6]

[6] We analyzed data for the 10%, 20%, and 30% of Massachusetts schools districts with the highest level of economic disadvantage according to the federal E-rate eligibility levels, which are based on the percentage of students eligible for the national school lunch program and the district's location (rural or urban).

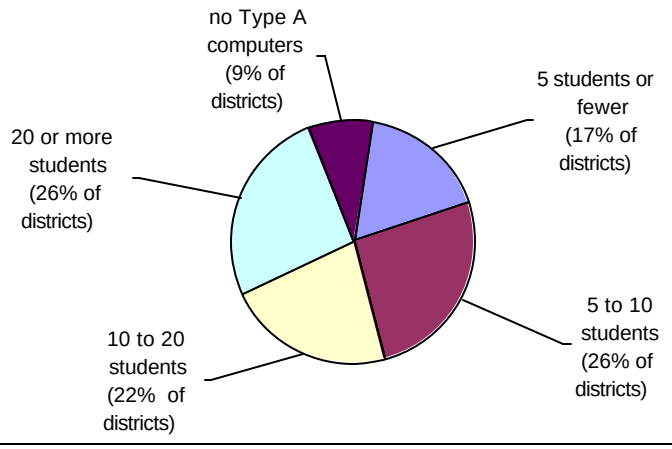
High-end Computers

Each year the computer industry develops faster, more powerful machines, leading the Department to reevaluate the specifications for Type A computers. In 2001, Type A computers were redefined as those with at least 64 MB RAM.[7]

Type A computers allow students to take full advantage of the learning opportunities offered by today's technology. For example, using these more powerful computers, students can work with more than one software application at a time, for instance researching a topic on the Internet and taking notes using word processing software. Type A computers also make it possible for students to view streaming video presentations on the Internet, participate in online teleconferences with their peers around the globe, and create their own digital videos.

Figure 5 shows the range of student-to-computer ratios for computers with at least 64 MB of memory (Type A computers).

Figure 5 : Students per Type A Computer



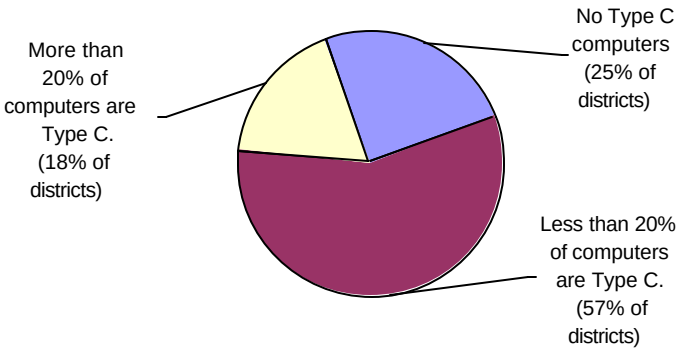
Older Computers

In nearly every Massachusetts school, the majority of computers are classified as modern computers (Type A or Type B). However, 75% of schools have some older computers (Type C computers). When these computers are included in the total count, the statewide access ratio becomes 4.8 students per computer.

[7] In measuring districts' progress in meeting the benchmark standard for access to modern computers, the Department counts both Type A and Type B computers. The specifications for Type B computers will remain the same until at least 2003, providing a baseline for measuring districts' progress.

Although older computers are not practical for working with multimedia or doing research on the World Wide Web, some schools are finding it useful and cost-effective to continue using them for specific tasks. For example, older machines work quite well for basic word processing and learning keyboarding skills. In addition, there are many software packages that have stood the test of time and that work very well on older computers. Also, if a computer has a CD-ROM drive, it can be used in a library as a station for using electronic encyclopedias.

Figure 6: Percentage of Type C Computers in Districts



Portable Computers and Devices

Some schools are purchasing portable computers and devices, which can be circulated from classroom to classroom. Over half of the schools reported that they had at least one laptop computer, with 5% of schools owning 20 or more laptops. Even more schools are using devices such as the AlphaSmart or DreamWriter, finding them to be a cost-effective way to offer students access to word processing or data gathering. Of the schools that submitted data, 55% had at least one AlphaSmart, and 21% had 20 or more AlphaSmarts. In addition, nearly 6% of schools are using handheld computers.

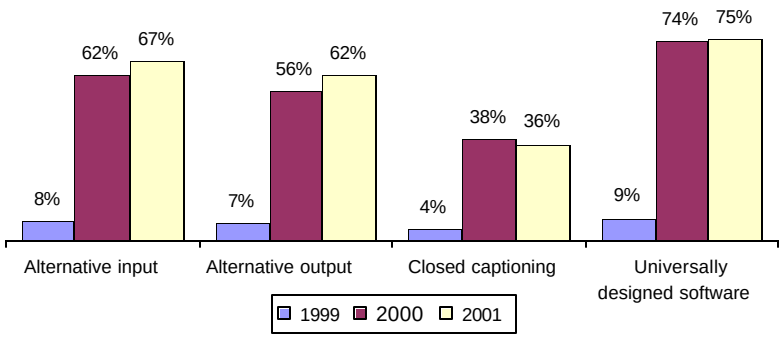
Technology for All Students

Today's technologies offer a range of tools that can help all students access the curriculum, including students with disabilities. Schools should plan universal access for computers and provide assistive technology whenever appropriate. Examples of assistive technologies include alternative keyboards, pointing devices, large screen monitors, screen readers, and voice recognition software. Schools should also provide universally

designed software, which is designed for the widest possible spectrum of students, including students with disabilities, students learning English, and so on.[8]

In 2001, 93% of schools reported that they consider accessibility for all students when purchasing technologies. Figure 7 summarizes the availability of assistive technologies in schools across the state. Many of these tools are helpful to a wide range of students, including students with learning disabilities and second language learners.

Figure 7: Percentage of Schools Reporting Availability of Assistive Technologies



Connectivity

The Internet continues to offer a wealth of resources for teaching and learning, with students and teachers going online for research, international communication, information sharing, teleconferencing, and distance learning.

Connectivity offers additional benefits for Massachusetts schools, due to the state's efforts in developing Virtual Education Space (VES). VES is a set of online tools designed to support education reform and to bring together administrators, educators, students, parents, mentors, and tutors into one teaching and learning environment.[9]

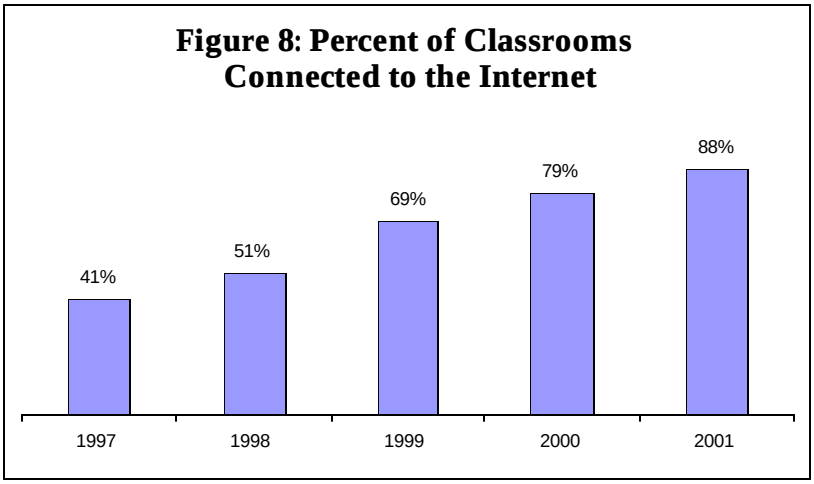
In light of the many learning opportunities and tools available online, the benchmark standards recommend that every classroom and administrative office have at least one computer with a high-speed Internet connection by the year 2003.

[8] Information on universal design can be found at the Web site for CAST, a "not-for-profit organization that uses technology to expand opportunities for all people, including those with disabilities." http://www.cast.org

[9] For more information on VES, go to http://www.ves.mass.edu/

Classroom Connections

The data collected from schools reveal that the average school district has Internet connections in 88% of its classrooms. As Figure 8 shows, the percentage of classrooms with Internet access has steadily increased over the past five years.



Further examination of the data reveals that 60% of districts have all of their classrooms connected to the Internet, with the majority providing multiple connections in each classroom. Some of the remaining districts have opted to provide more Internet connections in computer labs instead of connecting every classroom. Therefore, it is also useful to look at the percent of computers that are connected in a district, regardless of whether they are in a classroom or a lab. As Figure 9 shows, 69% of schools have more than 80% of their computers connected to the Internet. It is possible, however, that this data is slightly inflated because some districts reported may have more than one type of connection for some of their computers.

Equity

Data collected at the national level have shown that there are inequities in Internet access that correspond with economic disadvantage.[10] The Massachusetts data are consistent with this finding; school districts with the highest concentration of students in poverty have 79% of their classrooms connected, compared to the statewide average of 88%. Moreover, only 25% of the poorer districts have all of their classrooms connected, compared to 60% of districts statewide.[11]

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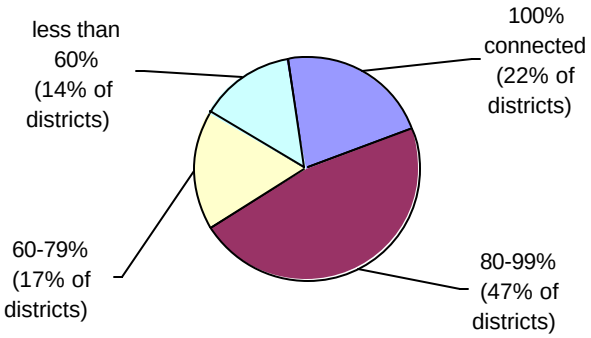
[10] For more information, see *Internet Access in U.S. Public Schools and Classrooms: 1994-2000*, published by the National Center for Education Statistics, which is available at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2001071

[11] We analyzed data for the 10% of Massachusetts schools districts with the highest level of economic disadvantage according to the federal E-rate eligibility levels, which are based on the percentage of students eligible for the national school lunch program and the district's location (rural or urban).

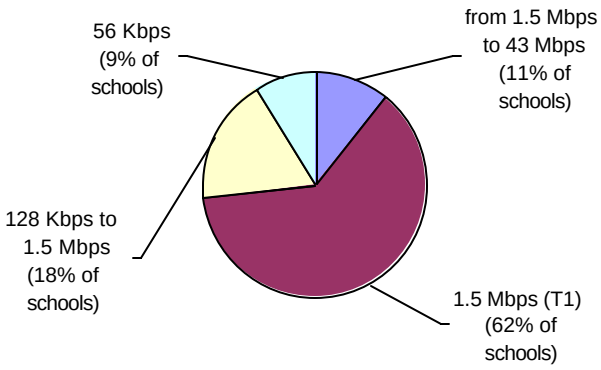
Figure 9: Percent of Computers Connected to the Internet



Connection Speed

The type of Internet connection is important in supporting teaching and learning. Broadband connections of T1 or greater allow students to access the rich multimedia and interactive content available on the Web. The data collected from school districts in 2001 indicate that 73% of schools now have such a connection, as Figure 10 shows.

Figure 10: Internet Connection Speeds



Challenges and Strategies

Many districts are faced with aging buildings, which make it more difficult and costly to wire the classrooms for the Internet. In fact, nearly 80% of Massachusetts schools were built more than 25 years ago. In addition, according to district staff, 42% of schools do not have adequate electrical capacity to support a ratio of five students per Internet-

connected computer. Building renovation projects may provide a cost-effective opportunity for districts to upgrade their infrastructure. Current data show that nearly 51% of school buildings received a large influx of technology as a result of building renovation.

Some districts have encountered problems in wiring their schools. Recently some schools have dealt with this challenge by using wireless connections. In 2001, 13% of schools had at least one wireless connection. Half of these schools had 10 or more wireless connections. Some schools are finding it useful, as well as cost effective, to purchase wireless mobile laptop computer labs, which can circulate from classroom to classroom, providing Internet access to students for curriculum projects.

Funding may be a reason that some schools have not connected every classroom to the Internet. However, of the districts that had not met the benchmark for connectivity, 36% were not making use of the federal E-rate discounts. Taking advantage of these discounts can help schools complete the job of connecting every classroom to the Internet.[12]

Internet Safety

Because the Internet connects millions of people all over the world, it presents safety issues that schools must address, such the potential threat of inappropriate materials or persons who attempt to exploit children. For this reason, the benchmark standards recommend that every district have an Acceptable Use Policy regarding Internet use.

According to the 2001 data, most Massachusetts schools have Acceptable Use Policies. Eighty percent of districts have such policies in their elementary schools, while 72% have policies in their middle schools, and 76% have them in their high schools.

In order for these policies to be effective, students must know them. It is important for teachers to talk with students about the school's Acceptable Use Policy before they use the Internet. It is also a good idea to publish the policy in the student handbook or on the school Web site. However, only 64% of districts included Acceptable Use Policies in their high school student handbooks, while less than 60% included them in middle and elementary schools student handbooks. Less than 40% of districts included their Acceptable Use Policies on their Web sites.

A new federal law, the Children's Internet Protection Act (CIPA), provides guidelines for Internet safety. Under CIPA, schools must certify that they have an Internet safety policy and that they are using filtering technology before they will be considered eligible for E-rate discounts. To be in compliance with CIPA, the Internet filter must block all visual descriptions that are obscene, child pornographic, or harmful to minors.[13]

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[12] For more information on the E-rate program, go to the Web site of the Universal Service Administrative Company http://www.universalservice.org/

[13] A report and order about the Children's Internet Protection Act can be downloaded in Microsoft Word format at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-01-120A1.pdf

Schools will find additional recommendations for teaching about Internet safety, as well as other social and ethical issues relating to Internet use, in the state's recently published *Recommended PreK-12 Instructional Technology Standards*.[14] For example, the standards recommend that students learn to evaluate the information presented on Web sites. Additionally, for middle and high school students, the standards recommend that students learn how media and technology can distort or exaggerate information.

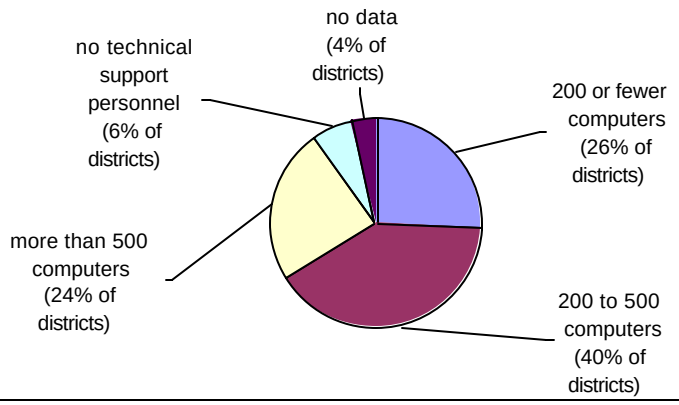
Technical Support

Keeping the computers and networks up and running is critical to successful technology implementation. When students and teachers cannot rely on computers to be in good working order, they are less likely to use them. If the computers are not used, the district's investment will have been compromised.

Technical Support Personnel

To provide a support system that keeps downtime to a minimum, the benchmark standards recommend that districts have at least one full-time equivalent (FTE) staff person to support 100 to 200 computers. Over the past year there has been an increase in the number of districts providing this level of technical support. In 2001, 26% of districts reported that they had one full-time person to support 200 computers or fewer, while in 2000, only 18% did.

Figure 11: Computers per Technical Support Personnel



Even though more districts are meeting the benchmark standard, the statewide average for technical support has changed from 358 computers per technical support person in

[14] *Recommended PreK-12 Instructional Technology Standards for Students*. The complete document can be downloaded in PDF format at http://www.doe.mass.edu/edtech/01docs/itstand01.pdf

2000 to 439 computers per technical support person in 2001. There are several possible explanations for this change. Districts may be purchasing additional computers without discarding the old ones, so technical support personnel have more computers to service. The change may also be due to more accurate reporting by districts. Another possibility is that districts have discovered other ways of providing technical support.

Other Ways to Provide Technical Support

To provide technical support districts usually employ network/system managers or coordinators, maintenance/repair specialists, lab coordinators, managers, and technicians. However, there are other ways to provide support.

In some districts, the technical support teams include students participating in technology leadership programs such as the Massachusetts Tech Prep Program, [15] TechBoston, [16] and Youth Tech Entrepreneurs (YTE)[17]. These programs develop technology curricula preparing students for careers, higher education, and leadership. For example, the TechBoston program, which offers a wide range of technical courses to middle and high school students and teachers, has created a TechCorps to support technology in schools and other community organizations.

Other districts are harnessing technology to facilitate technical support. For example, some districts are using online help desk systems to create a formal process of reporting and responding to service requests. These reporting systems make it easier for the technical staff to prioritize service requests. A district's Web site can also include information that will help computer users solve their own problems, such as troubleshooting guides, answers to frequently asked questions, and tutorials on popular software programs.

In Malden, for instance, each school building has a team of two to faculty members who provide technical support in additional to their regular duties as teachers or administrators. These building technology people attend monthly meetings, complete several days of training in the summer, and receive a small stipend. The Malden schools also use an online system for reporting and tracking service requests. Using this system, the district is able to track the turnaround time for fixing problems, which averages 24 to 48 hours.

Since the ultimate goal for technical support is to have the computers in working order as much of the time as possible, future data on turnaround time for technical support should provide a clearer picture of the adequacy of technical support.

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[15] For more information about the Massachusetts Tech Prep Program, go to http://www.mccte.org/links/techprep.html

[16] For more information about TechBoston, go to http://www.techboston.org/

[17] For more information about Youth Tech Entrepreneurs (YTE), go to http://www.yte.org/

Technology Curriculum Integration

In a recent report from the National Center for Education Statistics, 82% of teachers reported that they were not given enough time outside their regular teaching duties to learn, practice, or plan how to use computers and other technologies.[18] To help ensure successful integration of technology into the classroom, the benchmark standards recommend that schools employ one 0.5 full-time equivalent (FTE) person to support every 30-60 professional staff persons.

Defining Curriculum Integration Support

The people usually responsible for curriculum integration support are instructional technology specialists, media specialists, and library teachers. The support they provide typically includes researching, locating and evaluating curriculum resources, identifying effective practices that incorporate technology, and providing professional development. In addition, these people may take the responsibility for ensuring that teachers and students meet the new technology standards. To carry out all of these functions, the curriculum integration person's activities may include consulting with teachers, modeling effective teaching with technology, collaborating with teachers to develop appropriate, technology-rich lessons, and providing workshops on technology integration.

Many districts are increasingly recognizing the importance of the curriculum integration person. Project MEET (Massachusetts Empowering Educators with Technology), a federally funded project, provides a model to support this concept.[19] Every school involved in Project MEET designates one teacher as the technology curriculum integration person. These specialists support their colleagues as they work to integrate technology into the curriculum. As a result of this support, according to a Project MEET 2000-2001 survey, the number of Project MEET elementary teachers using the Internet at least once a week increased by more than 51%.

Statewide Data

To calculate the ratio of curriculum integration persons to staff, districts are instructed to count only that portion of the person's time that is actually devoted to providing technology curriculum integration support. For example, if an instructional technology specialist spends part of each week providing technical support, that time should not be counted in calculating this ratio.

This year 41% of districts reported that they employ one half-time curriculum integration person for up to 60 professional staff. This data may be slightly inflated because districts may have counted some staff time that was not solely devoted to supporting technology curriculum integration.

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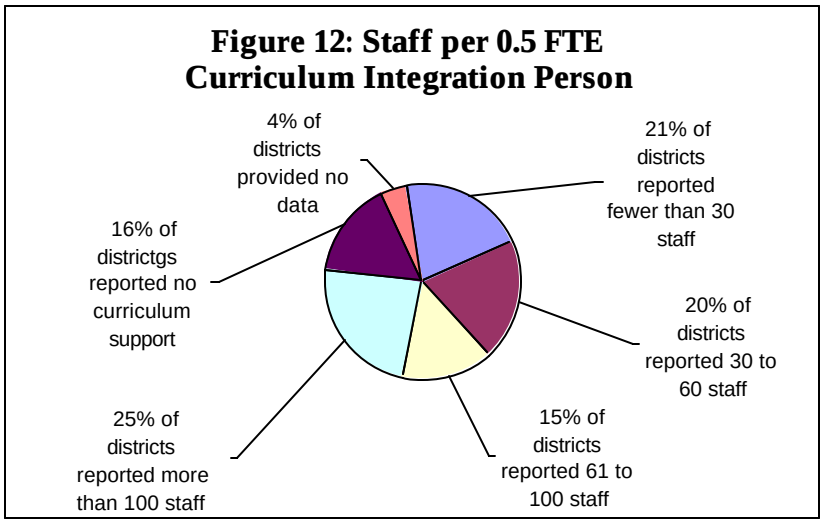
[18] *Teachers' Tools for the 21st Century: A Report on Teachers' Use of Technology*, a 2000 report from the National Center for Education Statistics. The report can be downloaded in PDF format at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2000102

[19] For more information on Project MEET, go to http://www.doe.mass.edu/edtech/teacher/projectmeet/

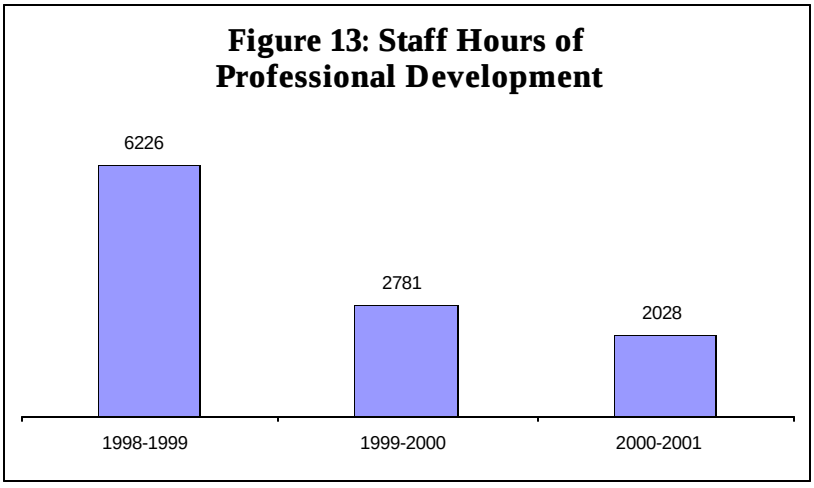


Technology Professional Development

The benchmark standards recommend that by 2003 at least 85% of district staff will have participated in technology professional development sponsored by the district.

Formal Professional Development

In 2001, the percentage of district staff who participated in formal technology professional development such as workshops, courses, and study groups decreased slightly, to a level of 51%. The estimated number of staff hours of formal professional development also decreased, as shown in Figure 13.

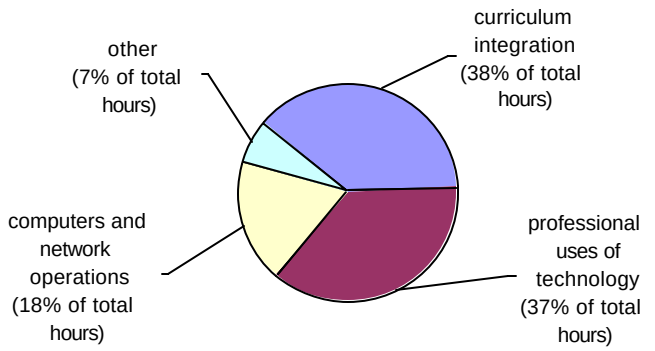


The total time spent on formal technology professional development may have decreased because many districts had provided basic technology skills training in past years and are

now providing fewer hours of this type of training. It is also possible that, as technology is integrated in subject area professional development it is not being reported as technology professional development per se. Another possible explanation is that districts may be providing more ongoing support for teachers, rather than formal technology professional development workshops.

As Figure 14 shows, curriculum integration was the most common type of technology professional development in 2001. Also common was professional development for professional use, which includes a variety of software tools, telecommunications, assistive technologies, and ethics. Less common was training on the basics of computers and network operations, topics that now may be familiar to many teachers.

Figure 14: How Professional Development Hours Were Spent



Strategies for Ongoing Professional Development

Although workshops and courses are useful, many teachers say that they learn most effectively through other means, such as co-teaching, sharing ideas with colleagues, or working with a knowledgeable mentor. A mentor might, for example, help a teacher locate technology resources or tools that are appropriate for a specific curriculum unit.

Recognizing the importance of this type of continuous support, the Department asked schools to estimate the percentage of staff reached by these methods. In 2001, 81% of districts reported using this kind of professional development, a substantial increase since 2000, when 56% of districts reported using it. Still, the average percentage of staff reached using these methods remains low at 33%. In addition, it is likely that at least some of the staff reached by these methods may be the same people who are participating in formal professional development programs.

Because of its continuous nature, this kind of professional development can be difficult to measure. However, some educators are using technology to help with this measurement.

During the 2000-2001 school year, Project MEET, which makes extensive use of ongoing professional support, pioneered the use of handheld computers to track the time that is spent supporting teachers. Throughout the school day, the technology curriculum integration people record their interactions with teachers, using a specially designed database installed in the handheld computer. This method of collecting data has resulted in more complete reporting of the professional development activities and support.

Online Professional Development

Online professional development makes it possible to combine the structured format of formal professional development with the ongoing support that teachers find helpful. Virtual Education Space (VES) provides various opportunities for online professional development, which teachers can pursue from virtually any location at any time of day.[20] Some teachers have used VES to access online courses. Others have participated in online extensions to content institutes that they initially attended in person.

Many educators have been using VES to share information and ideas with their colleagues, both in their own districts and across the state. In an average month, approximately 5,800 people used VES more than once a week. Some educators have also been using VES's CLASP-OnLine (Curriculum Library Alignment and Sharing Program) to develop curriculum guides and teaching units aligned with state and district standards, as well as to explore curriculum created in other districts.

Effective Professional Development

Technology professional development should focus on how technology supports the teaching and learning of the content areas. It should align with the *Massachusetts Curriculum Frameworks* and the *Recommended PreK-12 Instructional Technology Standards,* expanding teachers' knowledge of the standards.

Professional development should also provide an opportunity for teachers to explore and evaluate a range of pedagogical practices, including strategies that will meet the needs of different types of learners. Moreover, it should encourage teachers to implement improved practices in the classroom, with a focus on raising student achievement. Like the technology that is used effectively in the classroom the technology used in professional development should be appropriate, reliable, available, and cost-effective.

[20] For more information on VES, go to http://www.ves.mass.edu/

Access to the Internet Outside the School Day

The benchmark standards recommend that districts work with community groups to ensure that students and staff have sufficient access to the Internet outside the school day. The standards also recommend that districts maintain a catalog of places in the community where students and staff can access Internet-connected computers after hours.

Massachusetts districts have made some progress towards the benchmark standard, with 49% now reporting that they work with community groups to ensure that students and staff can access the Internet after school hours. However, only 20% of districts provide an up-to-date catalog of information on how students can gain access to the Internet after school.

Access for Students

Numerous reports have shown that students from lower income households are far less likely to have access to computers and the Internet at home than their classmates from higher income households. The importance of this access was underscored by a recent national survey in which 68% of secondary school students said that their teachers assigned homework that required the use of a computer.[21] In the same survey, 71% of students who had home computers reported that they used them at least twice a week to do homework.

Through Virtual Education Space (VES), Massachusetts students will eventually have an opportunity to set up personal workspaces on the Internet, where they can store homework assignments, works in progress, and portfolios of their work.[22] Students will be able to use their VES workspaces to access their assignments and pick up where they left off regardless of what computer they are using. So, for example, a student will be able to begin writing an essay on a school computer and then finish it on a computer at the public library or community center, without needing to copy the file onto a disk.

Beginning in October of 2001, high school students were provided with access through VES to an online tutorial program designed specifically to improve their performance on the MCAS. By February of 2002, nearly 7,000 students had taken advantage of this program, which assesses their skills and provides remediation and practice tests.

Access for Educators

VES currently offers all Massachusetts educators the opportunity to register and set up personal workspaces on Virtual Education Space (VES). These personal workspaces can be used to store lesson plans, curriculum materials, and records, which can then be accessed from any computer. By the end of 2001, nearly 39,000 people had signed up for the service.

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[21] *Education Week/Market Data Retrieval/Harris Poll of Students and Technology*. The results of this survey can be downloaded in PDF format at http://www.edweek.org/sreports/tc01/35survey.pdf

[22] For more information on VES, go to http://www.ves.mass.edu/

Educators are also able to access the MCAS tutorial through VES, allowing them to generate diagnostic reports and track students' performance. Additionally, educators can use this resource to access lessons that are aligned to the skills tested on the MCAS. Nearly 1,000 educators have registered for this service.

Appendix A

Local Technology Plan Benchmark Standards for the Year 2003

Background

In 1995, school districts were asked to submit a Local Technology Plan (LTP) so that they would be eligible to receive state and local technology funding. The federal government requires that districts have a state-approved and updated Local Technology Plan to be eligible for E-rate discounts. From 1995 to 1996, the Massachusetts Department of Education approved all the technology plans submitted by school districts. Since then, the Department has asked school districts to update their plans and report on their progress annually. Since 1998, districts have submitted their *Tech Plan Updates* on-line.

To help districts develop purposeful plans, the Department established a set of benchmark standards. These standards are not mandated but rather represent the minimum conditions for districts to meet by 2003.

With the guidance of a group of district technology specialists from across the state, the Department outlined six benchmark standards to guide districts in establishing goals for their Local Technology Plans. The six standards are as follows:

Benchmark Standard 1: Commitment to a Clear Vision and Mission Statement

A. The district has a realistic and clearly stated set of goals. It is committed to achieving its vision by the target year 2003.
B. The district has a technology team.
C. The district has a budget for its local technology plan. The district's operational budget includes a line item for technology.
D. The district leverages the use of state, federal, and private resources.

Benchmark Standard 2: Access

By the year 2003, every district will have achieved at least a 5:1 student-to-computer ratio of modern, fully functioning, Internet-enabled computers and devices.

Benchmark Standard 3: Infrastructure for Connectivity

The district ensures that every classroom and every administrative office have at least one computer with a high-speed connection to the Internet by the year 2003. A building's electrical service must be sufficient to support the computers and networks installed.

Benchmark Standard 4: Technical Support, Technology Curriculum Integration, and Professional Development

TECH SUPPORT: The district ensures that every administrator, teacher, and student receives high-quality user and system support so that by the year 2003 there will be at least one FTE (full-time equivalent) person to support 100-200 computers. Technical support can be provided by dedicated staff or equivalent services.

CURRICULUM INTEGRATION: The district provides at least 0.5 FTE staff person to support every 30-60 users (staff only) in their efforts to achieve technology competency and to integrate technology into the curriculum.

TECHNOLOGY PROFESSIONAL DEVELOPMENT: By the year 2003, at least 85% of district staff will have participated in technology training sponsored by the districts.

ACCEPTABLE USE POLICY: The district has an Acceptable Use Policy regarding Internet use.

Benchmark Standard 5: Accurate Data Reporting

The district maintains accurate data that meet state IMS (Information Management System) standards.

Benchmark Standard 6: Access to the Internet Outside the School Day

A. The district works with community groups to ensure that by 2003, students and staff will have sufficient access to the Internet, which will enable them to work outside of the school day. The school must maintain a catalog of places in the community ("points of access") where students and staff can gain access to the Internet after school hours.
B. The district maintains an up-to-date Web site and every educator has an Internet account with the capability of sending e-mail and accessing the World Wide Web.

Appendix B

District Statistics

Districts Reporting

School districts that updated their technology plans in 2001 are included in the following tables. Districts that did not update their plans are not included.

Student Computer Ratios

The ratio of students per Type A/B computer is based on the number of instructional computers of these types reported on the 2001 individual school profile forms. The ratio of students per all types computers is based on the total number of instructional computers reported in all categories: Types A, B, and C.

The enrollment figures used were those reported by the districts for the 2000-2001 school year. Enrollment data for the current school year are not available at the time of this report. For the most accurate and current student computer ratios, districts should recalculate the ratios based on the current year's enrollment. If enrollment has increased, then this will be reflected in a greater number of students per computer. The ratios reported here are based on data aggregated from the school profile forms. We advise districts to calculate a student computer ratio for each school to ensure equitable access across the entire district.

During the period that this data was collected, Type A computers were defined as machines with 64 MB RAM or higher, which are capable of running multimedia applications, high-end applications, and streamed video. Type B computers were defined as multimedia computers with 16 MB RAM to 64 MB RAM, which have CD-ROM access and Internet capability using a browser. Type C computers were defined as machines with 16 MB RAM or lower, with or without Internet capability.

Classrooms Connected to the Internet

The percentage of classrooms connected to the Internet is based on reporting by individual schools on the school profile forms. Schools were asked to report the number of classrooms and the fastest Internet connection in each classroom. It is important to note that these statistics do not reflect the percentage of connected computers in a district, since some schools provide additional Internet connections in their computer labs.

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Abington	12.56	9.97	14
Acton	6.26	5.84	100
Acushnet	2.02	1.98	100
Agawam	5.96	5.42	19
Amesbury	6.5	5.5	74
Amherst	4.93	4.08	100
Andover	4.35	4.25	100
Arlington	5.06	4.63	100
Ashland	5.11	5.11	93
Attleboro	6.7	6.15	70
Auburn	6.24	6.24	99
Avon	5.37	5.37	100
Ayer	4.34	3.95	100
Barnstable	4.65	3.9	100
Bedford	3.23	3.06	100
Belchertown	6.38	6.24	60
Bellingham	9.54	9.2	69
Belmont	5.93	5.9	100
Berkley	9.77	8.04	91
Berlin	3.33	3.33	100
Beverly	5.63	5.3	75
Billerica	6.83	6.28	100
Boston	5.32	5.29	71
Bourne	3.64	3.5	99
Boxborough	4.66	4.56	100
Boxford	4.61	4.59	96
Boylston	2.22	2.22	100
Braintree	5.68	5.19	44
Brewster	53.08	4.83	100
Brimfield	8	8	100
Brockton	7.94	7.1	37
Brookfield	3.93	3.93	100
Brookline	3.8	3.66	88
Burlington	4.75	4.44	73
Cambridge	4.54	3.68	100
Canton	2.82	2.82	100
Carlisle	13.23	4.46	100
Carver	7.84	7.07	96
Chelmsford	2.97	2.85	100
Chelsea	4.96	4.66	100

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Chicopee	6.49	6.14	98
Clarksburg	7.23	5.86	100
Clinton	3.03	2.91	98
Cohasset	6.69	5.41	100
Concord	5.27	4.55	100
Conway	12	5.38	100
Danvers	6.67	6.67	100
Dartmouth	6.57	5	100
Dedham	3.45	3.45	100
Deerfield	6.52	6.52	100
Douglas	5.99	5.47	100
Dover	7.8	6.79	55
Dracut	9.07	7.82	100
Duxbury	5.47	4.11	100
East Bridgewater	6.47	6.47	100
Eastham	14.3	8.41	100
Easthampton	5.24	4.9	65
East Longmeadow	3.01	3.01	100
Easton	7.27	6.62	100
Edgartown	3.73	3.73	100
Erving	2.65	2.65	100
Everett	7.15	5.83	43
Fairhaven	6.99	6.36	100
Fall River	9.05	6.39	19
Falmouth	10.31	7.27	74
Fitchburg	10.14	8.51	93
Florida	3.45	3.45	100
Foxborough	2.38	2.38	100
Framingham	6.77	5.99	100
Franklin	4.95	4.58	100
Freetown	3.01	3.01	100
Gardner	6.63	5.28	100
Georgetown	3.82	3.82	100
Gloucester	6.8	5.84	66
Grafton	7.74	5.4	100
Granby	7	6.69	100
Greenfield	9.29	6.53	77
Hadley	4.87	4.87	100
Halifax	8.6	6.84	100
Hancock	3.05	3.05	100
Hanover	3.18	2.65	100

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Harvard	6.88	5.16	100
Harwich	6.08	5.52	82
Hatfield	4.1	4.1	100
Haverhill	7.92	4.74	52
Hingham	4.85	4.39	100
Holbrook	17.48	3.92	100
Holland	5.4	4.64	100
Holliston	2.99	2.99	100
Holyoke	4.98	4.56	99
Hopedale	6.39	6.39	100
Hopkinton	3.47	3.43	100
Hudson	4.44	3.56	100
Hull	7.71	7.08	72
Ipswich	3.5	2.96	100
Kingston	4.86	4.6	100
Lakeville	4.8	4.8	100
Lanesborough	7.2	7.2	100
Lawrence	5.29	5.29	83
Lee	5.9	5.9	100
Leicester	5.52	5.38	100
Lenox	3.68	3.53	99
Leominster	8.33	7.38	90
Leverett	4.31	4.31	85
Lexington	5.27	4.21	100
Littleton	6.15	5.64	44
Longmeadow	7.09	5.85	73
Lowell	5.26	4.52	95
Ludlow	6.52	5.19	35
Lunenburg	7.9	7.9	100
Lynn	5.48	4.7	81
Lynnfield	4.26	3.27	81
Malden	3.28	3.28	69
Mansfield	8.05	6.68	97
Marblehead	7.03	6.27	84
Marion	5.47	5.47	100
Marlborough	8.12	6.46	100
Marshfield	17.34	12.68	38
Mashpee	6.88	6.88	100
Mattapoisett	6.89	6.16	88
Maynard	3.4	3.4	100
Medfield	9.56	6.78	100

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Medford	11.6	9.08	48
Medway	5.21	5	98
Melrose	4.98	4.98	71
Methuen	3.82	3.67	100
Middleborough	2.97	2.92	100
Middleton	9.14	5.95	47
Milford	7.81	7.01	82
Millis	4.56	4.01	100
Milton	8.54	7.72	66
Monson	3.24	2.96	100
Nahant	2.74	1.91	100
Nantucket	4.04	3.98	100
Natick	5.62	5.28	76
Needham	6.13	5.33	100
New Bedford	5.55	4.69	62
Newburyport	8.35	5.98	100
Newton	7.54	5.42	66
Norfolk	5.42	5.38	100
North Adams	6.82	6.63	78
Northampton	6.06	5.81	100
North Andover	6.37	3.35	100
North Attleborough	3.53	3.45	89
Northborough	3.82	3.62	100
Northbridge	5.84	4.75	92
North Reading	10	7.04	52
Norton	4.93	4.42	100
Norwell	5.61	5.58	69
Norwood	6.58	6.58	100
Oak Bluffs	3.56	3.56	100
Orange	3.58	2.88	100
Orleans	5.67	5.67	100
Oxford	4.69	4.57	100
Palmer	5.68	5.6	100
Peabody	6.36	5.83	47
Pelham	3.34	3.26	75
Pembroke	5.51	5.03	100
Petersham	22.2	7.93	100
Pittsfield	4.53	4.05	100
Plainville	3.63	3.63	100
Plymouth	3.04	3.04	100
Plympton	4.76	4.18	100

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Provincetown	2.06	2.04	95
Quincy	9.89	6.04	100
Randolph	5.58	4.92	100
Reading	5.42	5.16	89
Revere	4.28	4.28	100
Rochester	4.45	4.26	100
Rockland	4.16	4.11	100
Rockport	3.81	3.63	100
Rowe	1.74	1.74	100
Salem	4.49	3.46	65
Sandwich	1.15	1.15	89
Saugus	5.45	4.7	69
Savoy	5.33	4.8	80
Scituate	8.12	7.47	100
Seekonk	3.65	3.65	100
Sharon	6.5	5.07	100
Sherborn	4.2	4.01	100
Shirley	7.24	4.28	96
Shrewsbury	4.11	3.85	100
Shutesbury	8.16	5.83	100
Somerset	4.19	4.19	100
Somerville	4.75	4.68	46
Southampton	6.11	6.11	100
Southborough	4.6	4.4	100
Southbridge	6.56	4.31	98
Springfield	5.74	4.8	39
Stoneham	6.95	6.79	92
Stoughton	2.81	2.81	100
Sturbridge	7.97	5.87	100
Sudbury	3.39	3.39	100
Sunderland	6.04	4.95	100
Sutton	3.12	2.67	100
Swampscott	8.78	8.47	89
Swansea	5.98	5.22	100
Taunton	3.25	3.25	100
Tewksbury	5.83	4.54	42
Tisbury	3.01	2.89	100
Topsfield	6.98	4.82	100
Truro	3.15	3.15	100
Tyngsborough	8.28	4.87	76
Uxbridge	7.86	7.23	92

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Wakefield	5.47	5.14	77
Wales	4.1	3.72	94
Walpole	4.98	4.11	60
Waltham	10.12	10.12	58
Ware	3.87	3.51	69
Wareham	4.82	4.44	100
Watertown	4.52	4.05	100
Wayland	5.79	5.46	100
Webster	8.94	7.59	50
Wellesley	4.02	3.56	100
Wellfleet	3.97	3.64	19
Westborough	4.36	4.36	100
West Boylston	3.06	2.8	100
West Bridgewater	5.8	5.8	100
Westfield	3.25	2.85	100
Westford	5.54	4.42	99
Westhampton	5.31	4.4	100
Westport	7.32	4.96	93
West Springfield	4.84	4.48	60
Westwood	6.18	5.49	92
Weymouth	8.98	8.57	98
Whately	6.3	6.3	100
Williamsburg	3.54	3.25	100
Williamstown	6.77	5.39	100
Wilmington	4.76	4.22	100
Winchendon	7.22	5.83	100
Winchester	8.37	6.77	72
Winthrop	8.66	8.59	100
Woburn	6.35	5.71	75
Worcester	4	3.84	99
Wrentham	2.46	2.46	100
Northampton-Smith	4.53	3.47	9
Atlantis Charter	6.29	4.27	100
Benjamin Banneker Charter	3.04	3.04	100
Barnstable Grade 5 Horace Mann Charter	6.08	4.29	100
Cape Cod Lighthouse Charter	3.89	3.64	93
Chelmsford Alliance/Ed Charter	7.48	7.48	100

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Community Day Charter	6.15	4.8	100
SABIS International Charter	19.6	17.82	13
Neighborhood House Charter	4.97	4.97	100
Abby Kelley Foster Reg Charter	6.51	6.51	100
Benjamin Franklin Charter	10.24	10.24	100
Hilltown Charter	7.24	6.15	22
Lynn Community Charter	7.94	7.69	0
Martha's Vineyard Charter	3.2	2.83	100
Mass Academy/Math & Science	3.63	2.49	100
Mystic Valley Adv Reg Charter	5.07	10.13	100
Francis W Parker Charter	8.09	8.09	100
River Valley Charter	11.88	11.88	100
Rising Tide Charter	3.31	3.31	100
Seven Hills Charter	1.36	1.21	100
Acton-Boxborough	4.44	4.23	100
Adams-Cheshire	7.83	7.09	75
Amherst-Pelham	4.22	3.92	100
Ashburnham-Westminster	5.89	5.89	100
Athol-Royalston	3.51	3.48	74
Berkshire Hills	3.99	3.82	100
Berlin-Boylston	5.01	4.9	31
Blackstone-Millville	6.25	6.16	99
Bridgewater-Raynham	7.33	5.73	88
Chesterfield-Goshen	4.08	4.08	100
Central Berkshire	6.76	5.33	100
Concord-Carlisle	4.44	4.09	100
Dennis-Yarmouth	6.85	5.22	100
Dighton-Rehoboth	5.84	5.84	100
Dover-Sherborn	4.86	4.34	100
Dudley-Charlton Reg	3.17	2.99	100
Nauset	12.26	3.4	94
Farmington River Reg	3.26	3.26	100
Freetown-Lakeville	3.94	3.65	52
Frontier	1.77	1.77	100
Gateway	5.77	4.96	72
Groton-Dunstable	8.55	5.71	83

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Gill-Montague	4.65	4.51	100
Hamilton-Wenham	4.14	3.61	100
Hampden-Wilbraham	4.38	4.34	100
Hampshire	3.45	2.93	100
Hawlemont	2.57	2.49	78
King Philip	4.67	4.5	99
Lincoln-Sudbury	4.78	4.01	8
Marthas Vineyard	2.09	2.01	100
Masconomet	3.42	3.42	100
Mendon-Upton	4.67	4.64	100
Mount Greylock	5.06	5.06	98
Mohawk Trail	4.35	3.41	99
Narragansett	5.21	4.84	74
Nashoba	3.96	3.4	100
New Salem-Wendell	8.05	5.36	100
Northboro-Southboro	5.13	4.06	100
North Middlesex	6.84	5.88	99
Old Rochester	6.93	5.48	34
Pentucket	7.17	4.95	100
Pioneer Valley	4.79	4.16	96
Quabbin	11.24	8.81	52
Ralph C Mahar	5.09	4.51	94
Silver Lake	5	5	100
Southern Berkshire	2.29	2.21	100
Spencer-E Brookfield	4.02	3.3	36
Tantasqua	5.12	4.93	97
Triton	3.81	3.38	100
Up-Island Regional	2.59	2.59	100
Wachusett	3.48	3.46	98
Whitman-Hanson	4.09	4.05	100
Assabet Valley	2.74	2.74	14
Blackstone Valley Reg	2.48	2.28	100
Blue Hills Voc	4.42	2.87	100
Bristol-Plymouth Voc Tech	1.52	1.52	91
Cape Cod Region Voc Tech	2.26	2.26	100
Franklin County	1.83	1.8	100
Greater Fall River	2.09	2.09	100
Greater Lawrence Reg Voc Tech	2.76	2.5	88

District Statistics

School district	Ratio of students to Type A/B computers	Ratio of students to all types of computers (Types A/B/C)	Percentage of classrooms connected to the Internet (any type access)
Greater New Bedford	3.16	3.06	95
South Middlesex Voc Tech Reg	2.23	2.16	75
Minuteman Voc Tech	1.96	1.7	99
Montachusett Voc Tech Reg	2.64	2.64	100
Northern Berkshire Voc	1.86	1.86	100
Nashoba Valley Tech	6.73	3.55	100
North Shore Reg Voc	3.31	3.31	94
Old Colony Reg Voc Tech	3.11	3.11	100
Shawsheen Valley Voc Tech	2.22	1.97	100
Southeastern Reg Voc Tech	3.3	3.3	100
South Shore Reg Voc Tech	2.58	2.58	4
Southern Worcester County Voc Tech	3.38	3.38	99
Tri County	1.65	1.65	100
Upper Cape Cod Voc Tech	1.52	1.52	100
Whittier Voc	2.29	2.22	100
Essex Agr Tech	2.72	2.43	84
Norfolk County Agr	4.38	4.34	72